Hardware Reference Guide

NI-700/900

NetLinx Integrated Controllers

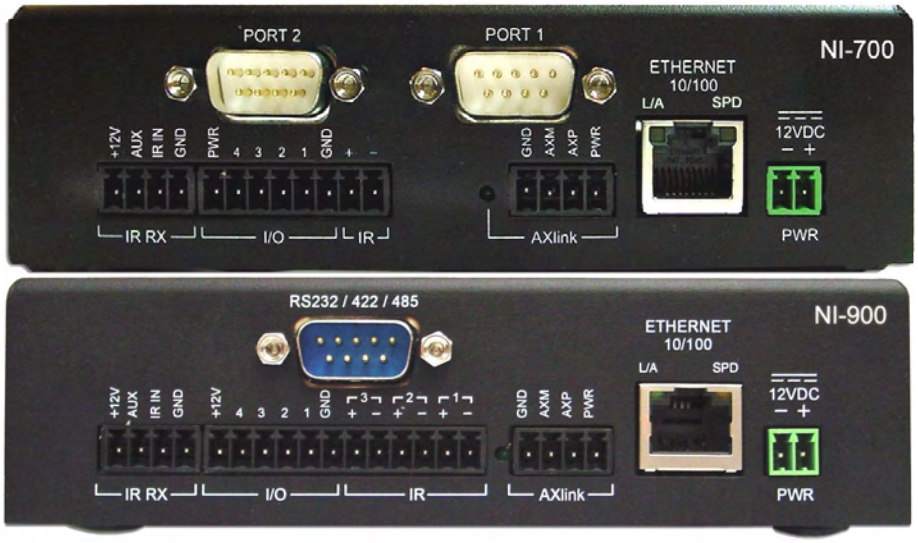

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Table of Contents

Introduction

NI-700 Overview

The NI-700 NetLinx Integrated Master Controller can be programmed to control RS-232/422/485, IR/Serial, and Input/Output devices through the use of both the NetLinx programming language and the NetLinx Studio application (version 2.4 or higher). Another key feature of this product is the ability to easily access the configuration switches without having to remove a cover plate.

NetLinx Integrated Master Controller Features	
NI-700 (FG2105-70)	• 1 RS-232 Program port • 2 RS-232/RS-422/RS-485 ports • 1 IR/Serial Output ports • 4 Digital Input/Output ports • 1 IR RX (receive) port *(works only with AMX IR Receivers)*

NOTE

When working with the NI-700 Integrated Controller, verify you are using the latest version of NetLinx Studio v 2.4 or higher (available for download from www.amx.com).

NI-700 Specifications

The front LEDs (FIG. 1) are grouped by control type and are labeled according to their corresponding port (connector) numbers on the rear of the unit.

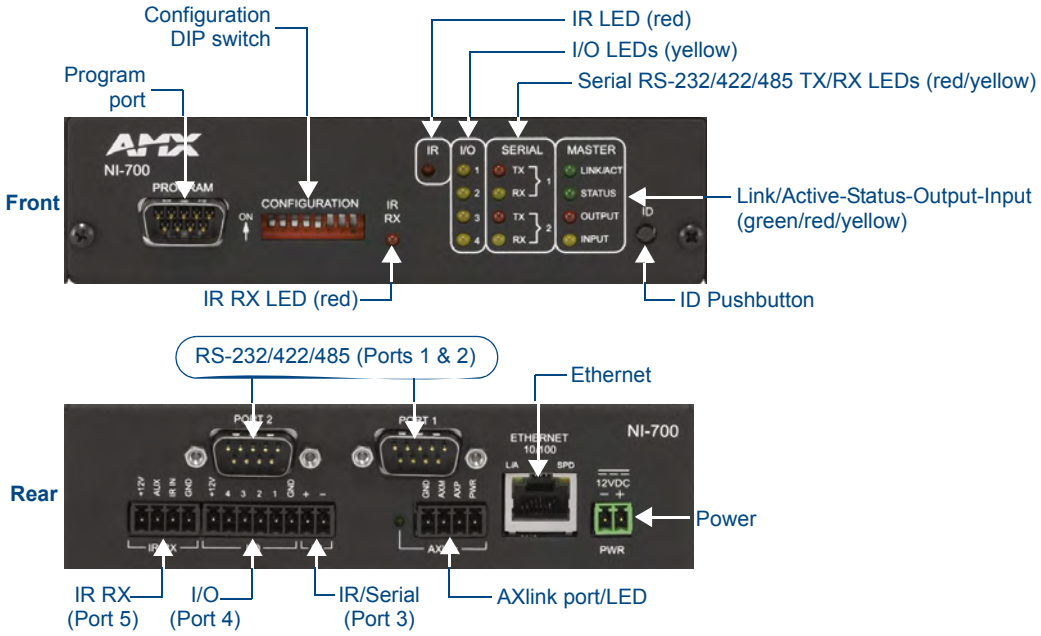


FIG. 1 NI-700 NetLinx Integrated Controller

NI-700 Specifications	
Dimensions (HWD):	• 1.58" x 5.54" x 5.12" (4.01 cm x 14.10 cm x 13.00 cm) • 1 RU (rack unit) high
Power Requirements:	• 280 mA @ 12 VDC
Memory:	See the *NI-700 On-Board Memory Specifications* section on page 4.
Microprocessor:	• 304 MIPS
Weight:	• 1.30 lbs (0.59 kg)
Enclosure:	• Metal with black matte finish
Certifications:	• FCC Part 15 Class B, CE, and IEC 60950
Front Panel Components:	
Program port	• RS-232 DB9 connector (male) can be connected to a DB9 port on a computer. This port can be used with both Serial and NetLinx programming commands. It is also used to both upload and download information from the NetLinx Studio 2.4 program.
Configuration DIP switch	• Sets the communication parameters for the Program port.
IR RX LED	• Red LED lights to when IR data is being received via the rear IR RX port.
IR LED	• Red LED lights during the transmission of IR or Serial data via the rear IR port.
I/O LEDs	• **Four** yellow LEDs light when the rear I/O channels 1-4 are active. LED indicator for each I/O port reflects the state of that particular port.
Serial LEDs	• **Two** sets of red and yellow LEDs light when the rear DB9 Ports (1 & 2) are transmitting or receiving RS-232, 422, or 485 data: - TX LEDs (red) light when transmitting data - RX LEDs (yellow) light when receiving data - LED activity reflects transmission and reception activity • These LEDs do not reflect changes in either the RTS or CTS when hardware handshaking is used.
LINK/ACT	• Green LED lights when the Ethernet cable is connected and an active link is established. This LED also blinks when receiving Ethernet data packets.
Status	• Green LED lights when the Controller is programmed and communicating properly.
Output	• Red LED lights when the Controller transmits data, sets channels On/Off, sends data strings, etc.
Input	• Yellow LED lights when the Controller receives data from button pushes, strings, commands, channel levels, etc.
ID pushbutton	Provides the NetLinx ID (**D:S**) assignment for the device. • The D notation is used to represent a device number. • The S notation is used to represent the System number of the Master. Refer to the *NetLinx Integrated Controller WebConsole & Programming Guide* for details.
Rear Panel Connectors:	
RS-232/422/485 (Ports 1 & 2)	• **Two** RS-232/422/485 control ports using DB9 (male) connectors with XON/XOFF (transmit On/transmit Off), CTS/RTS (clear to send/ready to send), and 300 - 115,200 baud. • Channel range = 1 - 255 • Channels 1 - 254 provide feedback • Channel 255 (CTS Push channel): Reflects the state of the CTS Input if a 'CTSPSH' command was sent to the port • Output data format for each port is selected via software • Two DB9 connectors provide RS-232/422/485 termination

NI-700 Specifications (Cont.)	
Rear Panel Components (Cont.):	
IR RX (Port 5)	• 4-pin 3.5 mm mini-Phoenix port is used to connect one or more (8 maximum) IRX-SM+ swivel mount or IRX-DM+ Decora mount IR receivers. • The IR RX port functions using AMX IR codes (38 KHz and 455 KHz) and works **ONLY with AMX IR Receivers** such as the IRX-DM+ and IRX-SM+.
Digital I/O (Port 4)	• Four-channel binary I/O port for contact closure with each input being capable of voltage sensing. • Input format is software selectable. • Interactive power sensing for IR ports • Channel range = 1 - 4 • All inputs are assigned to respective IR/Serial ports for "automatic" power control through the use of software commands. Power control is provided via commands such as: 'PON', 'POF', 'POD', 'DELAY', I/O Link etc.). • Contact closure between GND and an I/O port is detected as a PUSH • When used as voltage input - I/O port detects a low signal (0- 1.5 VDC) as a PUSH and a high signal (3.5 - 5 VDC) as a RELEASE • When used as an output - each I/O port acts as a switch to GND and is rated at 200 mA @ 12 VDC • Single 6-pin 3.5 mm mini-Phoenix (female) connector provides I/O port termination ***Note**: This IO uses 5V logic but can handle up to 12V without harm. It can handle up to 12V on the input. At higher voltages you run a higher risk of surge damage.*
IR/Serial (Port 3)	• 4-pin 3.5 mm mini-Phoenix port is capable of generating IR with the use of an IR Emitter (***while in IR mode***). This port can support high-frequency carriers of up to 1.142 MHz and can also generate IR with no carrier frequency. • The output is capable of three electrical formats: IR, Serial, and Data • Single IR/Serial signal can be generated. • Channel range = 1 - 255 • Channels 1 - 128 (output): IR commands • Channels 129 - 253: used as reference channels • Channel 254 (feedback): Power Fail (used with 'PON' and 'POF' commands) • Channel 255 (feedback): Power status (when IO Link is set) • IR ports support data mode (at limited baud rates and wiring distances). • Single 2-pin 3.5 mm mini-Phoenix (female) connector provides IR port termination
AXlink LED	• Green LED indicates the state of the AXlink connector port. • Normal AXlink activity = 1 blink/second • Abnormal AXlink activity = cycle of 3 consecutive blinks and then Off
AXlink port	• 4-pin 3.5 mm mini-Phoenix (male) connector provides data and power to external control devices.
Ethernet port	• RJ-45 port for 10/100 Mbps communication. The Ethernet Port automatically negotiates the connection speed (10 Mbps or 100 Mbps) and whether to use half duplex or full duplex mode.
Ethernet Link/ Activity LED	• Ethernet Port: RJ-45 port for 10/100 Mbps communication. LEDs show communication activity, connection status, speeds, and mode information: **SPD** (speed) - Yellow LED lights On when the connection speed is 100 Mbps and turns Off when the speed is 10 Mbps. **L/A** (link/activity) - Green LED lights On when the Ethernet cables are connected and terminated correctly, and blinks when receiving Ethernet data packets.
Power port	• 2-pin 3.5 mm mini-Phoenix (male) connector. • Use a 12 VDC-compliant power supply to provide power to the NI-700 through the 2-pin 3.5 mm mini-Phoenix connector on the rear panel.

NI-700 Specifications (Cont.)	
Operating Environment:	• Operating Temperature: 0° C (32° F) to 50° C (122° F) • Operating Humidity: 20% - 85% RH
Included Accessories:	• 2-pin 3.5 mm mini-Phoenix female PWR connector (41-5025) • 4-pin 3.5 mm mini-Phoenix female connector (41-5047) • 6-pin 3.5 mm mini-Phoenix female I/O connector (41-5063) • CC-NIRC IR Emitter • NI-700 Quick Start Guide
Other AMX Equipment:	• AC-RK Accessory Rack Kit (**FG515**) • CC-NIRC IR cables (**FG10-000-11**) • CC-NSER IR/Serial cables (**FG10-007-10**) • CSB Cable Support Bracket (**FG517**) • IRX-DM+ IR Sensor (**FG458-10** and **FG458-11**) • IRX-SM+ IR Sensor (**FG455-01**) • PMB Pole Mount Bracket (**FG531**) • STS, Serial To Screw Terminal (**FG959**) • Surface Mount Bracket Accessory (**FG525**)

NI-700 Port Assignment And Functionality

NI-700 Port Assignments	
Port	ICSP Port #
Serial Port #1	1
Serial Port #2	2
IR Port	3
I/O Port	4
IR RX Port	5

NI-700 On-Board Memory Specifications

There are two variations on the NI-700, with different memory specifications. The latest version of the NI-700 has double the on-board memory of previous versions.

- The latest version of the NI-700 is **FG2105-70**
- Previous versions of the NI-700 are **FG2105-03**

NI-700 On-Board Memory Specifications	
FG2105-70	• 64 MB SDRAM *(not upgradeable)* • 32 MB Flash chip *(not upgradeable)* • 512 Kb of Non-volatile SRAM
FG2105-03	• 32 MB SDRAM (*not upgradeable*) • 16 MB Flash chip (*not upgradeable*) • 512 Kb of Non-volatile SRAM

NI-900 Overview

The NI-900 is the first NetLinx device to be Duet-compatible straight out of the box. Duet is a dual-interpreter firmware platform from AMX which combines the proven reliability and power of NetLinx with the extensive capabilities of the *Java®2 MicroEdition* (J2ME) platform. Duet simplifies the programming of a system that includes the NI-900 and other third party devices by standardizing device and function definitions, defaulting touch panel button assignments, and controlling feedback methods. Dynamic Device Discovery makes integration even easier by automatically identifying and communicating with devices which support this new beaconing technology.

The NI-900 unit (**FG2105-09**) is geared to meet the specific control and automation needs of a single room environment requiring the control of several IR devices, where both price and functionality are the driving requirement. This product is configured to control a limited number of video players, projectors, lighting, thermostats, and other electronic equipment.

NetLinx Integrated Master Controller Features	
NI-900 (FG2105-90)	• 1 RS-232 Program port • 1 RS-232/RS-422/RS-485 ports • 3 IR/Serial Output ports • 4 Digital Input/Output ports • 1 IR RX (receive) port *(works only with AMX IR Receivers)*

NOTE

When working with the NI-900 Integrated Controller, verify you are using the latest version of NetLinx Studio v 2.4 or higher (available for download from www.amx.com).

NI-900 Specifications

The front LEDs (FIG. 2) are grouped by control type, and are numbered according to their corresponding port (connector) numbers on the rear of the unit.

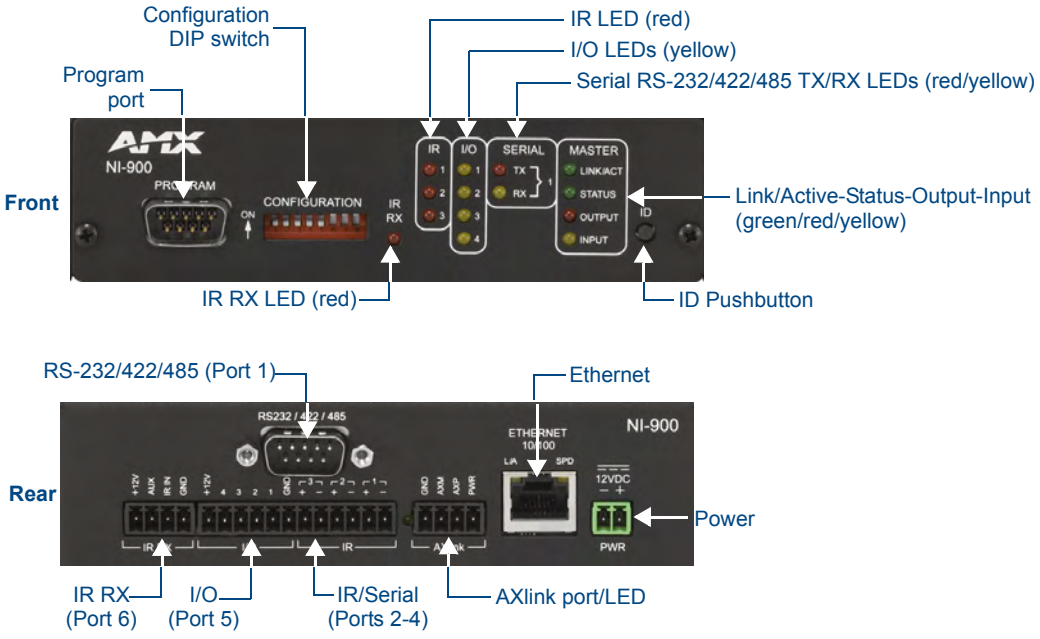


FIG. 2 NI-900 NetLinx Integrated Controller

NI-900 Specifications	
Dimensions (HWD):	• 1.58" x 5.54" x 5.12" (4.01 cm x 14.10 cm x 13.00 cm) • 1 RU (rack unit) high
Power Requirements:	• 300 mA @ 12 VDC
Memory:	See the *NI-900 On-Board Memory Specifications* section on page 9.
Microprocessor:	• 304 MIPS
Weight:	• 1.30 lbs (0.59 kg)
Enclosure:	• Metal with black matte finish
Certifications:	• FCC Part 15 Class B, CE, and IEC 60950
Front Panel Components:	
Program port	• RS-232 DB9 connector (male) can be connected to a DB9 port on a computer. This port can be used with both Serial and NetLinx programming commands. It is also used to both upload and download information from the NetLinx Studio 2.4 program.
Configuration DIP switch	• Sets the communication parameters for the Program port.
IR RX LED	• Red LED lights to when IR data is being received via the rear IR RX port.
IR LEDs	• **Three** red LEDs light during the transmission of IR or Serial data via the rear IR port.
I/O LEDs	• **Four** yellow LEDs light when the rear I/O channels 1 - 4 are active. LED indicator for each I/O port reflects the state of that particular port.
Serial LEDs	• One set of red and yellow LEDs light when the rear DB9 Port (1) transmits or receives RS-232, 422, or 485 data: - TX LED (red) lights when transmitting data - RX LED (yellow) lights when receiving data - LED activity reflects transmission and reception activity • These LEDs do not reflect changes in either the RTS or CTS when hardware handshaking is used.
LINK/ACT	• Green LED lights when the Ethernet cable is connected and an active link is established. This LED also blinks when receiving Ethernet data packets.
Status	• Green LED lights when the Controller is programmed and communicating properly.
Output	• Red LED lights when the Controller transmits data, sets channels On/Off, sends data strings, etc.
Input	• Yellow LED lights when the Controller receives data from button pushes, strings, commands, channel levels, etc.
ID pushbutton	Provides the NetLinx ID (**D:S**) assignment for the device. • The D notation is used to represent a device number. • The S notation is used to represent the System number of the Master. • Refer to the *NetLinx Integrated Controller WebConsole & Programming Guide* for details.
Rear Panel Components:	
RS-232/422/485 (Port 1)	• RS-232/422/485 control port uses a DB9 (male) connector with XON/XOFF (transmit On/transmit Off), CTS/RTS (clear to send/ready to send), and 300 - 115,200 baud. • Channel range = 1 - 255 • Channels 1 - 254 provide feedback • Channel 255 (CTS Push channel): Reflects the state of the CTS Input if a 'CTSPSH' command was sent to the port • Output data format for each port is selected via software • A single DB9 connector provides RS-232/422/485 termination

NI-900 Specifications (Cont.)	
Rear Panel Components (Cont.):	
IR RX (Port 6)	• 4-pin 3.5 mm mini-Phoenix port is used to connect one or more (8 maximum) IRX-SM+ swivel mount or IRX-DM+ Decora mount IR receivers. • The IR RX port functions using AMX IR codes (38 KHz and 455 KHz) and works **ONLY with AMX IR Receivers** such as the IRX-DM+ and IRX-SM+.
Digital I/O (Port 5)	• Four-channel binary I/O port for contact closure with each input being capable of voltage sensing. • Input format is software selectable. • Interactive power sensing for IR ports • Channel range = 1 - 4 • All inputs are assigned to respective IR/Serial ports for "automatic" power control through the use of software commands. Power control is provided via commands such as: 'PON', 'POF', 'POD', 'DELAY', I/O Link etc.). • Contact closure between GND and an I/O port is detected as a PUSH • When used as voltage input - I/O port detects a low signal (0 - 1.5 VDC) as a PUSH and a high signal (3.5 - 5 VDC) as a RELEASE • When used as an output - each I/O port acts as a switch to GND and is rated at 200 mA @ 12 VDC • Single 6-pin 3.5 mm mini-Phoenix (female) connector provides I/O port termination ***Note**: This IO uses 5V logic but can handle up to 12V without harm. It can handle up to 12V on the input. At higher voltages you run a higher risk of surge damage.*
IR/Serial (Ports 2 - 4)	• This multi-port (*containing three sets of IR connectors*) is capable of generating IR with the use of an IR Emitter (***while in IR mode***). These ports can support high-frequency carriers of up to 1.142 MHz and can also generate IR with no carrier frequency. • Each output is capable of three electrical formats: IR, Serial, and Data • Multiple IR/Serial signals can be generated. • Channel range = 1 - 255 • Channels 1 - 128 (output): IR commands • Channels 129 - 253: used as reference channels • Channel 254 (feedback): Power Fail (used with 'PON' and 'POF' commands) • Channel 255 (feedback): Power status (when IO Link is set) • IR ports support data mode (at limited baud rates and wiring distances). • Single 2-pin 3.5 mm mini-Phoenix (female) connector provides IR port termination
AXlink LED	• Green LED indicates the state of the AXlink connector port. • Normal AXlink activity = 1 blink/second • Abnormal AXlink activity = cycle of 3 consecutive blinks and then Off
AXlink port	• 4-pin 3.5 mm mini-Phoenix (male) connector provides data and power to external control devices.
Ethernet port	• RJ-45 port for 10/100 Mbps communication. The Ethernet Port automatically negotiates the connection speed (10 Mbps or 100 Mbps) and whether to use half duplex or full duplex mode.

NI-900 Specifications (Cont.)	
Rear Panel Components (Cont.):	
Ethernet Link/ Activity LED	• Ethernet Port: RJ-45 port for 10/100 Mbps communication. LEDs show communication activity, connection status, speeds, and mode information: **SPD** (speed) - Yellow LED lights On when the connection speed is 100 Mbps and turns Off when the speed is 10 Mbps. **L/A** (link/activity) - Green LED lights On when the Ethernet cables are connected and terminated correctly, and blinks when receiving Ethernet data packets.
Power port	• 2-pin 3.5 mm mini-Phoenix (male) connector. • Use a 12 VDC-compliant power supply to provide power to the NI-900 through the 2-pin 3.5 mm mini-Phoenix connector on the rear panel.
Operating Environment:	• Operating Temperature: 0° C (32° F) to 50° C (122° F) • Operating Humidity: 20% - 85% RH
Included Accessories:	• 2-pin 3.5 mm mini-Phoenix female PWR connector (41-5025) • 6-pin 3.5 mm mini-Phoenix female I/O connector (41-5063) • NI-900 Quick Start Guide • Three CC-NIRC IR Emitters • Two 4-pin 3.5 mm mini-Phoenix female connector (41-5047)
Other AMX Equipment:	• AC-RK Accessory Rack Kit (**FG515**) • CC-NIRC IR cables (**FG10-000-11**) • CC-NSER IR/Serial cables (**FG10-007-10**) • CSB Cable Support Bracket (**FG517**) • IRX-DM+ IR Sensor (**FG458-10** and **FG458-11**) • IRX-SM+ IR Sensor (**FG455-01**) • PMB Pole Mount Bracket (**FG531**) • STS, Serial To Screw Terminal (**FG959**) • Surface Mount Bracket Accessory (**FG525**)

NI-900 Port Assignment And Functionality

NI-900 Port Assignments	
Port	ICSP Port #
Serial Port #1	1
IR/Serial Port #1	2
IR/Serial Port #2	3
IR/Serial Port #3	4
I/O Port	5
IR RX Port	6

NI-900 On-Board Memory Specifications

There are two variations on the NI-900, with different memory specifications. The latest version of the NI-900 has double the on-board memory of previous versions.

- The latest version of the NI-900 is **FG2105-90**
- Previous versions of the NI-900 are **FG2105-09**

NI-900 On-Board Memory Specifications	
FG2105-90	• 64 MB SDRAM *(not upgradeable)* • 32 MB Flash chip *(not upgradeable)* • 512 Kb of Non-volatile SRAM
FG2105-09	• 32 MB SDRAM (*not upgradeable*) • 16 MB Flash chip (*not upgradeable*) • 512 Kb of Non-volatile SRAM

TimeKeeper

The NI series of controllers use a combination lithium battery and clock crystal package called a ***Timekeeper***. Only one *Timekeeper* unit is installed within a given NI controller. The battery can be expected to have up to 3 years of usable life under very adverse conditions. Actual life is appreciably longer under normal operating conditions. This calculation is based on storing the unit without power in 50° C (120° F) temperature until battery levels are no longer acceptable. The part number for a replacement battery is *57-0032*.

Related Documents

For information on using the on-board Web Console, as well as NetLinx send commands and terminal communications to configure the NI Controllers, refer to the *NetLinx Integrated Controller WebConsole & Programming Guide*.

NOTE

*All product documentation is available to view or download from **www.amx.com**.*

Installation

Device:Port:System (D:P:S)

A device is any hardware component that can be connected to an AXlink or ICSNet bus. Each device must be assigned a unique number to locate that device on the bus. The NetLinx programming language allows numbers in the range 1-32,767 for ICSNet (255 for AXlink).
Only the Device value can be set through the DIP switch settings mentioned above.

NetLinx requires a Device:Port:System (D:P:S) specification. This D:P:S triplet can be expressed as a series of constants, variables separated by colons, or a DEV structure. For example:

```
STRUCTURE DEV
{
INTEGER Number  // Device number
INTEGER Port    // Port on device
INTEGER System  // System the device belongs to
}
```

The D:P:S notation is used to explicitly represent a device number, port and system.
For example, 128:1:0 represents the first port on device 128 on this system.

If a device is declared in a NetLinx program with just the Device number (**System and Port are omitted**), the NetLinx Compiler assumes it has a **Port number of 1 and a System number of 0**. However, you should convert all existing device declarations using the D:P:S (Device:Port:System) notation. This enables certain NetLinx specific debugging features and can help pinpoint other possibly obscure errors.

Here's the syntax:

```
NUMBER:PORT:SYSTEM
```

where:

NUMBER:	16-bit integer represents the device number
PORT:	16-bit integer represents the port number (in the range 1 through the number of ports on the Controller or device)
SYSTEM:	16-bit integer represents the system number (0 = this system)

Installing into an Equipment Rack

Use the optional AC-RK Accessory Rack Kit (**FG515**) to mount the Controller into a standard 19" equipment rack.

1. Discharge the static electricity from your body by touching a grounded object.
2. Align the front of the NI-700/900 through any of the three rectangular openings on the AC-RK.
3. Use the included mounting screws to secure the unit's faceplate to the AC-RK.
4. Thread the cables through the opening in the equipment rack. Allow for enough slack in the cables to accommodate for movement during the installation process.
5. Reconnect all cables to their appropriate source/terminal locations. Refer to the *Connections and Wiring* section on page 13 for more detailed wiring and connection information.
   - Verify that the terminal end of the power cable is not connected to the a power supply before plugging in the 2-pin power connector.

To prevent repetition of the installation, test the incoming wiring by connecting the Controller's connectors to their terminal locations and applying power. Verify that the unit is receiving power and functioning properly. Disconnect the terminal end of the power cable from the connected 12 VDC-compliant power supply.

6. Align the ends of the AC-RK with the screw openings along the sides of the equipment rack.
7. Secure the AC-RK to the rack by using the four #10-32 screws (80-0186) and four #10 washers (80-0342) supplied in the kit.
8. Apply power to the unit to complete the installation process.

Connections and Wiring

Setting the Configuration DIP Switch (for the Program Port)

Prior to installing the Controller, use the Configuration DIP switch to set the baud rate used by the Program port for communication. The Configuration DIP switch is located on the front of the Integrated Controllers.

Baud Rate Settings

Before programming the on-board Master, make sure the baud rate you set matches the communication parameters set on both your PC's COM port and those set through your NetLinx Studio v 2.4.

By default, the baud rate is set to **38,400** (bps).

Baud Rate Settings on the Configuration DIP Switch

Baud Rate	Position 5	Position 6	Position 7	Position 8	
9600 bps	OFF	ON	OFF	ON	
38,400 bps (**default**)	OFF	ON	ON	ON	
57,600 bps	ON	OFF	OFF	OFF	
115,200 bps	ON	ON	ON	ON	

NOTE

Note the orientation of the Configuration DIP Switch and the ON position label.
DIP switches 2,3, and 4 must remain in the OFF position at all times.

Program Run Disable (PRD) Mode

You can also use the Program port's Configuration DIP switch to set the on-board Master to Program Run Disable (**PRD**) mode according to the settings listed in the table below.

PRD Mode Settings

PRD Mode	Position 1	
Normal mode (default)	OFF	
PRD Mode	ON	

The **PRD** mode prevents the NetLinx program stored in the on-board Master from running when you power up the Integrated Controller. This mode should only be used when you suspect the resident NetLinx program is causing inadvertent communication and/or control problems.

If necessary, place the on-board Master in PRD mode and use the NetLinx Studio v 2.4 program to resolve the communication and/or control problems with the resident NetLinx program. Then download the new NetLinx program and try again.

Think of the PRD Mode (On) equating to a PC's SAFE Mode setting. This mode allows a user to continue powering a unit, update the firmware, and download a new program while circumventing any problems with a currently downloaded program. Power must be cycled to the unit after activating/deactivating this mode on the Program Port DIP switch #1.

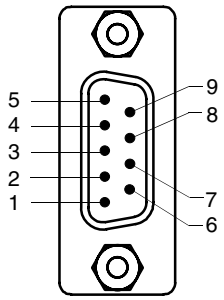
Working With the Configuration DIP Switch

1. Disconnect the power supply from the 2-pin PWR (green) connector on the rear of the NetLinx Integrated Controller.
2. Set DIP switch positions according to the information listed in the*Baud Rate Settings on the Configuration DIP Switch* and*PRD Mode Settings* tables.
3. Reconnect the 12 VDC-compliant power supply to the 2-pin 3.5 mm mini-Phoenix PWR connector.

Program Port Connections and Wiring

The Integrated Controllers are equipped with a Program port located on the front of the unit. Use an RS232 programming cable to establish a connection between this Program port to your PC's COM port. This connection provides communication with the NetLinx Integrated Controller. Then you can download NetLinx programs to this on-board Master using the NetLinx Studio v 2.4 software program. Refer to the *NetLinx Studio* instruction manual for programming instructions. The following table shows the rear panel Program Port connector (male), pinouts, and signals.

Program Port, Pinouts, and Signals

Program Port Connector	Pin	Signal
 Male	2	RX
	3	TX
	5	GND
	7	RTS
	8	CTS

*When wiring the 422/485 connections, do **NOT** use pre-made 9-wire cable or connect the wire in the cable to any connection that will not be used by the DB9 serial port. Only use wiring that connects the needed pins.*

Modes and Front Panel LED Blink Patterns

The following table lists the modes and blink patterns for the front panel LEDs associated with each mode. These patterns are not evident until after the unit is powered.

Modes and LED Blink Patterns

Mode	Description	LEDs and Blink Patterns		
		STATUS (green)	OUTPUT (red)	INPUT (yellow)
OS Start	Starting the operating system (OS).	On	On	On
Boot	On-board Master is booting.	On	Off	On
Contacting DHCP server	On-board Master is contacting a DHCP server for IP configuration information.	On	Off	Fast Blink
Unknown DHCP server	On-board Master could not find the DHCP server.	Fast Blink	Off	Off
Downloading Boot firmware	Downloading Boot firmware to the Master's on-board flash memory. Do not cycle power during this process!	Fast Blink	Fast Blink	Fast Blink
No program running	There is no program loaded, or the program is disabled.	On	Normal	Normal
Normal	On-board Master is functioning normally.	1 blink per second	Indicates activity	Indicates activity

Port Assignments and Functionality

The Port Assignments are as follows:

NI-700 Port Assignments

Port	ICSP Port #
Serial Port #1	1
Serial Port #2	2
IR/Serial Port	3
I/O Port	4
IR RX Port	5

NI-900 Port Assignments

Port	ICSP Port #
Serial Port #1	1
IR/Serial Port #1	2
IR/Serial Port #2	3
IR/Serial Port #3	4
I/O Port	5
IR RX Port	6

AXlink Port and LED

Both the NI-700 and NI-900 have an AXlink port and adjacent status LED (FIG. 1). This port allows the NI to support AMX Legacy AXlink devices such as G3 touch panels (*ex: CP4/A*) and PosiTrack Pilot devices. A green LED shows AXlink data activity. When the AXlink port is operating normally, blink patterns include:

- **Off** - No power, or the controller is not functioning properly
- **1 blink per second** - Normal operation.
- **3 blinks per second** - AXlink bus error. Check all AXlink bus connections.

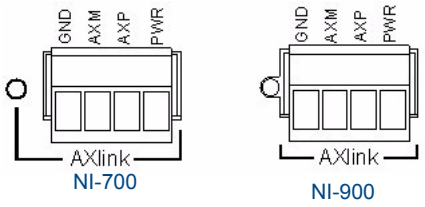


FIG. 1 AXlink connector and LED

The AXlink port can be used to supply power to downstream AXlink-compatible devices as long as both the power required is LESS THAN 2 Amps total and the external power supply feeding the NI unit has the necessary power capability.

Wiring Guidelines

The Integrated Controllers use a 12 VDC-compliant power supply to provide power to the Controller through the rear 2-pin 3.5 mm mini-Phoenix PWR connector. Use the power requirements information described in the product's Specifications table to determine the power draw.

The incoming PWR and GND cable from the power supply must be connected to the corresponding locations within the PWR connector.

WARNING

This unit should only have one source of incoming power.
Using more than one source of power to the Controller can result in damage to the internal components and a possible burn out.
Apply power to the unit only after installation is complete.

Wiring Length Guidelines

Refer to the following tables for the wiring length information used with your particular NetLinx Integrated Controller:

Wiring Guidelines - NI-700 @ 280 mA	
Wire size	**Maximum wiring length**
18 AWG	387.10 feet (117.99 meters)
20 AWG	245.74 feet (74.90 meters)
22 AWG	158.50 feet (48.31 meters)
24 AWG	96.70 feet (29.47 meters)

Wiring Guidelines - NI-900 @ 300 mA	
Wire size	**Maximum wiring length**
18 AWG	361.27 feet (110.12 meters)
20 AWG	229.36 feet (69.91 meters)
22 AWG	147.93 feet (45.01 meters)
24 AWG	90.25 feet (27.51 meters)

Preparing Captive Wires

You will need a wire stripper and flat-blade screwdriver to prepare and connect the captive wires.

WARNING

Never pre-tin wires for compression-type connections.

1. Strip 0.25 inch (6.35 mm) of insulation off all wires.
2. Insert each wire into the appropriate opening on the connector (according to the wiring diagrams and connector types described in this section).
3. Tighten the screws to secure the wire in the connector. Do not tighten the screws excessively doing so may strip the threads and damage the connector.

Wiring A Power Connection

To use the 2-pin 3.5 mm mini-Phoenix connector with a 12 VDC-compliant power supply, the incoming PWR and GND cables from the external source must be connected to their corresponding locations on connector (FIG. 2).

1. Insert the PWR and GND wires on the terminal end of the 2-pin 3.5 mm mini-Phoenix cable. ***Match the wiring locations of the +/- on both the power supply and the terminal connector.***
2. Tighten the clamp to secure the two wires. *Do not tighten the screws excessively; doing so may strip the threads and damage the connector.*
3. Verify the connection of the 2-pin 3.5 mm mini-Phoenix to the external 12 VDC-compliant power supply.

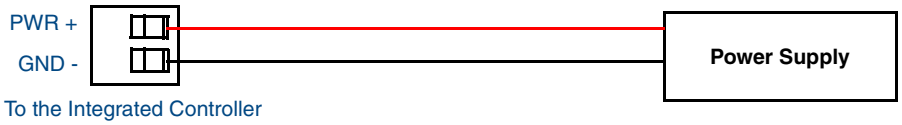


FIG. 2 2-pin mini-Phoenix connector wiring diagram (direct power)

Using the 4-pin Mini-Phoenix Connector For Data and Power

Connect the 4-pin 3.5 mm mini-Phoenix (female) captive-wire connector to an external NetLinx device as shown in FIG. 3.

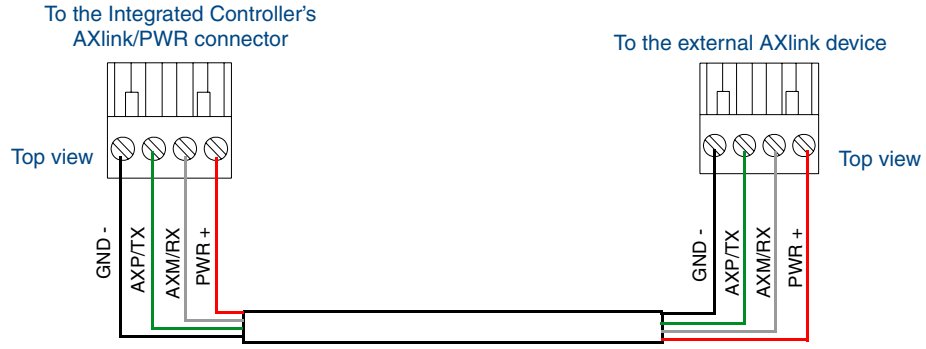


FIG. 3 Mini-Phoenix connector wiring diagram (direct data and power)

Using the 4-pin Mini-Phoenix Connector For Data With External Power

To use the 4-pin 3.5 mm mini-Phoenix (female) captive-wire connector for data communication and power transfer, the incoming PWR and GND cable from the 12 VDC-compliant power supply must be connected to the AXlink cable connector going to the Integrated Controller. FIG. 4 shows the wiring diagram. Always use a local power supply to power the Integrated Controller unit.

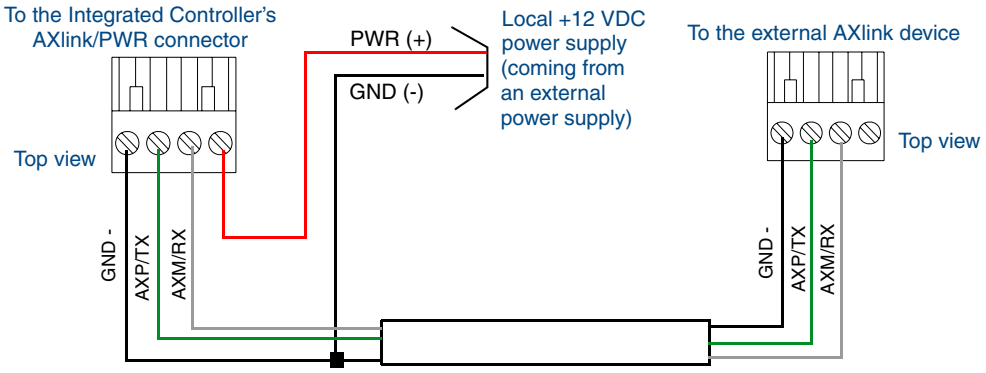


FIG. 4 4-pin mini-Phoenix connector wiring diagram (using external power source)

WARNING

*When you connect an external power supply, do not connect the wire from the PWR terminal (coming from the external device) to the PWR terminal on the Phoenix connector attached to the Controller unit. Make sure to connect **only** the AXM, AXP, and GND wires to the Controller's Phoenix connector when using an external power supply.*

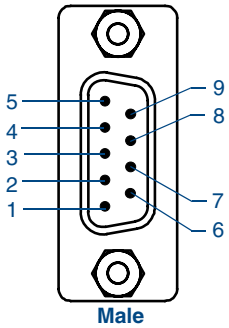
Make sure to connect only the GND wire on the AXlink/PWR connector when using a separate 12 VDC power supply. Do not connect the PWR wire to the AXlink connector's PWR (+) opening.

DB9 Device Port: Connections and Wiring

FIG. 5 shows the connector pinouts for the rear RS-232/RS-422/RS-485 (DB9) Device Ports.

The NI-700 has two ports whereas the NI-900 only has one available DB9 Device Port.

These ports support most standard RS-232 communication protocols for data transmission. This figure gives a visual representation of the wiring specifications for the RS-232/422/485 Device connectors. Refer to the rear of the unit for more detailed connector pinout information.



DB9 Serial Port pinouts (male connector)

RS-232	RS-422	RS-485
Pin 2: RX signal	Pin 1: RX -	Pin 1: A (strap to 9)
Pin 3: TX signal	Pin 4: TX +	Pin 4: B (strap to 6)
Pin 5: GND	Pin 5: GND	Pin 5: GND
Pin 7: RTS	Pin 6: RX +	Pin 6: B (strap to 4)
Pin 8: CTS	Pin 9: TX -	Pin 9: A (strap to 1)

FIG. 5 RS-232/422/485 DB9 (male) connector pinouts for the rear Device Ports

NOTE

While the NI-900 is capable of receiving 8 and 9 bit characters, it cannot receive 7 bit, 1 stop bit data from a serial device (ex: 9600,N,7,1).

The table below provides information about the connector pins, signal types, and signal functions.

This table's wiring specifications are applicable to the rear RS-232/422/485 Device Port connectors on the: **NI-700 (Ports 1 & 2)** and **NI-900 (Port 1)**.

RS-232/422/485 Device Port Wiring Specifications					
Pin	**Signal**	**Function**	**RS-232**	**RS-422**	**RS-485**
1	RX-	Receive data		**X**	**X** (strap to pin 9)
2	RXD	Receive data	**X**		
3	TXD	Transmit data	**X**		
4	TX+	Transmit data		**X**	**X** (strap to pin 6)
5	GND	Signal ground	**X**	**X**	
6	RX+	Receive data		**X**	**X** (strap to pin 4)
7	RTS	Request to send	**X**		
8	CTS	Clear to send	**X**		
9	TX-	Transmit data		**X**	**X** (strap to pin 1)

IRX-RX Port: Connection and Wiring

The NI-700 and NI-900 units both have a single rear 4-pin IR receiver port (**IR RX**).

NOTE

The IR RX port functions using AMX IR codes (38 KHz and 455 KHz) and works ONLY with AMX IR Receivers such as the IRX-DM+ and IRX-SM+.

This port can be used to connect one or more (8 maximum in parallel) optional IRX-SM+ or IRX-DM+ Decora mount IR receivers to the Integrated Controller as shown in FIG. 6.

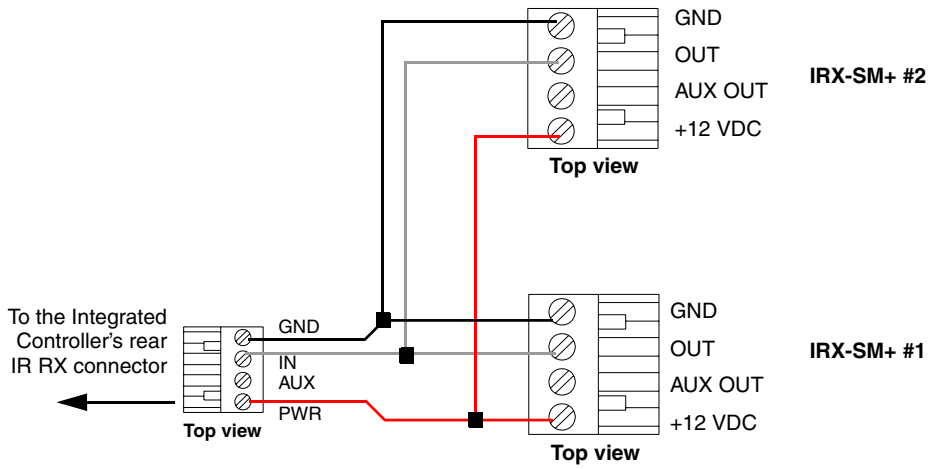


FIG. 6 IR RX port sample connections (AXlink to NetLinx connectors shown)

Input/Output (I/O) Port: Connections and Wiring

The I/O port responds to either switch closures, voltage level (high/low) changes, or it can be used for logic-level outputs. You can connect up to four devices to the NI-700 or NI-900 (FIG. 7).

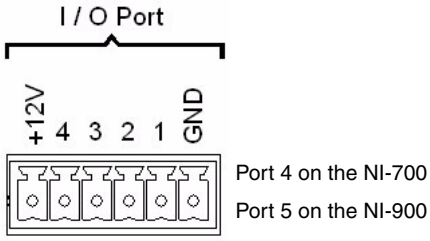


FIG. 7 INPUT/OUTPUT connector (male)

A contact closure between the GND and an I/O port is detected as a Push.

- When used for voltage inputs, the I/O port detects a low signal (0 - 1.5 VDC) as a Push, and a high signal (3.5 - 5 VDC) as a Release (*this IO port uses 5V logic but can handle up to 12V without harm).*
- When used for outputs, the I/O port acts as a switch to GND and is rated for 200 mA @ 12 VDC. This device can use up to 4 I/O ports (see table below).
- The PWR pin provides +12 VDC @ 200 mA and is designed as a power output for the PCS Power Current Sensors, VSS2 Video Sync Sensors (or equivalent).
- The GND connector is a common ground and is shared by all I/O ports. A common ground is shared with I/O ports 1 - 4 (see table below).

I/O Port Wiring Specifications		
Pin	**Signal**	**Function**
1	GND	Signal GND
2	I/O 1	Input/Output
3	I/O 2	Input/Output
4	I/O 3	Input/Output
5	I/O 4	Input/Output
6	12 VDC	PWR

IR/Serial Port: Connections and Wiring

You can connect only **one** IR- or Serial-controllable device to the IR/Serial connectors on the rear of the NI-700 (FIG. 8) but you can connect up to three IR- or Serial-controllable devices to the rear of the NI-900.

These connectors accept an IR Emitter (CC-NIRC) that mounts onto the device's IR window, or a mini-plug (CC-NSER) that connects to the device's control jack. You can also connect a data 0 - 5 VDC device. This unit comes with a single CC-NIRC IR Emitter (**FG10-000-11**).

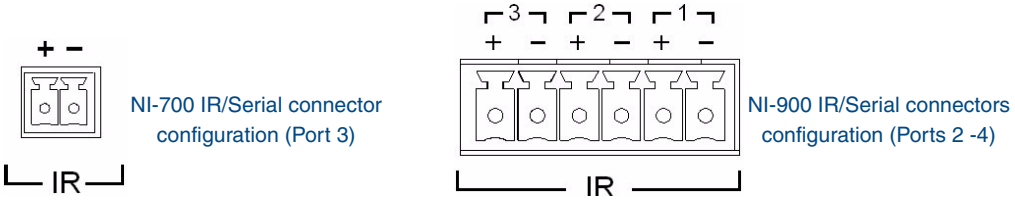


FIG. 8 IR/SERIAL connectors (male)

The IR/Serial connector wiring specifications are listed in the following table.

IR/Serial Connector Wiring Specifications (per Port)				
Number of IR connections	**NI-700 Port #**	**NI-900 Port #**	**Signal**	**Function**
1	3	2	GND (-) Signal 1 (+)	Signal GND IR/Serial data
2	N/A	3	GND (-) Signal 2 (+)	Signal GND IR/Serial data
3	N/A	4	GND (-) Signal 3 (+)	Signal GND IR/Serial data

Ethernet/RJ-45 Port: Connections and Wiring

The following table lists the pinouts, signals, and pairing for the Ethernet connector.

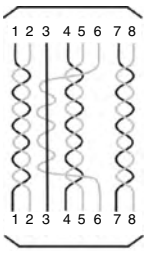
Ethernet RJ-45 Pinouts and Signals					
Pin	**Signals**	**Connections**	**Pairing**	**Color**	
1	TX +	1 --------- 1	1 --------- 2	Orange-White	
2	TX -	2 --------- 2		Orange	
3	RX +	3 --------- 3	3 --------- 6	Green-White	
4	no connection	4 --------- 4		Blue	
5	no connection	5 --------- 5		Blue-White	
6	RX -	6 --------- 6		Green	
7	no connection	7 --------- 7		Brown-White	
8	no connection	8 --------- 8		Brown	

FIG. 9 diagrams the RJ-45 pinouts and signals for the Ethernet RJ-45 connector and cable.

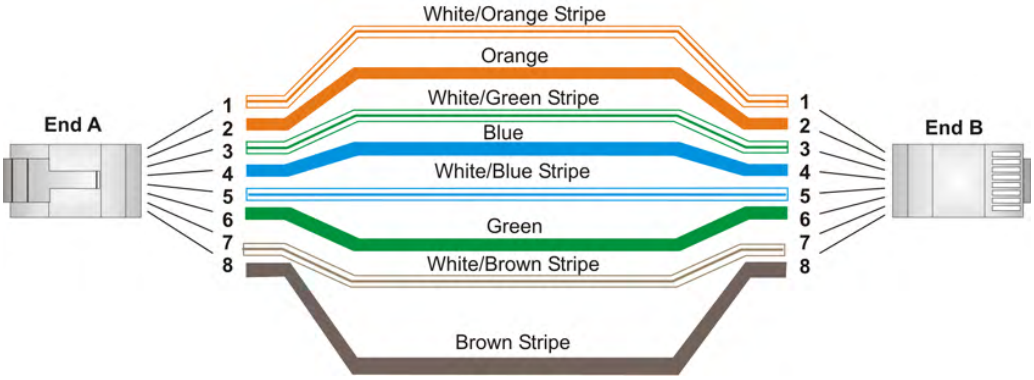


FIG. 9 RJ-45 wiring diagram

Ethernet LEDs

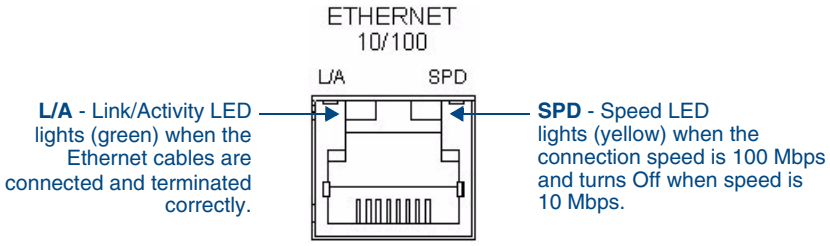


FIG. 10 Ethernet LEDs

NOTE

On NetLinx Masters (such as those aboard the NI-700), from within the Telnet or Terminal applications; you can send the ***`SET ETHERNET MODE`*** *command to assign the speed of your Ethernet connection.*
Sample command: `SET ETHERNET MODE AUTO`

The NI-700 and NI-900 only allow you to set the Ethernet mode to AUTO negotiate the Ethernet connection speed. Using any of the other connection modes (10 Half/Full or 100 Half/Full) results in an error message.

Ethernet Ports Used By the Integrated Controller

Ethernet Port Descriptions		
Port type	**Description**	**Standard Port #**
FTP	The on-board Master has a built-in FTP server.	21/20 (TCP)
SSH	The SSH port functions using the same interface as Telnet but over a secure shell where it uses SSL as a mechanism to configure and diagnose a NetLinx system. This port value is used for secure Telnet communication. Note: SSH version 2 is only supported.	22 (TCP)
Telnet	The NetLinx Telnet server provides a mechanism to configure and diagnose a NetLinx system. For maximum flexibility, the Master can be configured to utilize a different port than 23, or disable Telnet completely from either Telnet or the Program Port located on the rear of the Master itself. Once disabled, the only way to enable Telnet again is from the Master's Program port.	23 (TCP)
HTTP	The Master has a built-in web server that complies with the HTTP 1.0 specification and supports all of the required features of HTTP v1.1. This port is used for unsecure HTTP Internet communication between the web browser's UI and the target Master.	80 (TCP)
HTTPS/SSL	This port is used by a web browser to securely communicate between the web server UI and the target Master. This port is also used to simultaneously encrypt this data using the SSL certificate information on the Master as a key.	443 (TCP)
ICSP	Peer-to-peer protocol used for both Master-to-Master and Master-to-device communications. For maximum flexibility, the Master can be configured to utilize a different port than 1319, or disable ICSP over Ethernet completely from either Telnet or the Program Port located on the rear of the Master itself. This type of communication is used by the various AMX product for communication amongst themselves.	1319 (UDP/TCP)
integration! Solutions	This feature on the Master uses, by default, port 10500 for the XML based communication protocol. This port is connected to by the client web browser's JVM when integration! Solutions control pages are retrieved from the on-board Master's web server. For maximum flexibility, the on-board Master can be configured to utilize a different port than 10500 or to disable integration! Solutions completely.	10500 (TCP)

NOTE

While the NI-700 and NI-900 are capable of receiving 8 and 9 bit characters, they cannot receive 7 bit, 1 stop bit data from a serial device (ex: 9600, N,7,1).

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